Sub B1

A1

depends on said Schottky metal work function.

3. The diode of claim 1, wherein said n- doped GaN layer has an electron affinity, said barrier potential being approximately equal to said Schottky metal work function minus said electron affinity.

A2 Sub B2

6. The diode of claim 1, wherein said Schottky metal is one of the metals from the group comprising Ti, Cr, Nb, Sn, W, and Ta.

A3

Sub B3

15. A diode, comprising:

a layer of highly doped gallium nitride semiconductor material;

a layer of lower doped gallium nitride semiconductor material adjacent to the highly doped semiconductor material, said lower doped layer having an unpinned surface potential; and

a Schottky metal layer on said lower doped semiconductor material, said lower doped semiconductor material forming a junction with said Schottky metal having a barrier potential energy level that is dependent upon the type of Schottky metal, said barrier potential being of a magnitude that allows said diode to operate as a low forward voltage diode, said diode experiencing a reverse leakage current under reverse bias; and

a means for reducing the amount of said reverse leakage current.

A4

Sub B4

19. The diode of claim 15, wherein said Schottky metal contact has a work function, said barrier potential having an energy level that depends on said work function of said Schottky metal.

Sub B4(cont'd) A4

~~20. The diode of claim 18, further comprising a substrate adjacent to said n+ doped GaN layer, opposite said n- doped GaN layer.~~

Sub B5 A5

~~22. The diode of claim 15, wherein said Schottky metal is one of the metals in the group comprising Ti, Cr, Nb, Sn, W and Ta.~~

A6 Sub B6

43. A Schottky diode, comprising:

a semiconductor material having an unpinned surface potential; and

a Schottky metal having a work function and forming a junction with said semiconductor material that has a barrier potential, the height of said barrier potential depending upon said work function, said diode operating as a low forward voltage diode; and

a trench structure on the surface of said semiconductor material, said diode experiencing a reverse leakage current under reverse bias, said trench structure reducing the amount of reverse leakage current.

A7 Sub B7

47. The diode of claim 43, wherein the height of said barrier potential which depends positively on said work function of said Schottky metal.

48. The diode of claim 45, further comprising a substrate made of sapphire (Al_2O_3), silicon carbide (SiC) or silicon (Si), adjacent to said n+ GaN layer, opposite said n- GaN layer.

49. The diode of claim 43, wherein said Schottky metal is one of the metals in the group comprising Ti, Cr, Nb, Sn,

Sub B7 (cont'd) A7

~~W, Ta~~ and ~~other metals with similar work~~ functions.

Please add the following claims:

A8 Sub B8

52. The diode of claim 1, wherein said trench structure comprises a plurality of trenches with mesa regions between adjacent trenches, each of said trenches having sidewalls and a bottom surface coated by an insulating material, said Schottky metal layer covering said trenches and mesa regions, said insulating material sandwiched between said Schottky metal layer and said sidewalls and bottom surfaces.

53. The diode of claim 15, wherein said means for reducing reverse leakage current comprises a trench structure on the surface of said lower doped semiconductor material, said diode experiencing a reverse leakage current under reverse bias, said trench structure reducing the amount of reverse leakage current.

C8

54. The diode of claim 53, wherein said trench structure comprises a plurality of trenches with mesa regions between adjacent trenches, each of said trenches having sidewalls and a bottom surface coated by an insulating material, said Schottky metal layer covering said trenches and mesa regions, said insulating material sandwiched between said Schottky metal layer and said sidewalls and bottom surfaces.

55. The diode of claim 43, wherein said trench structure comprises a plurality of trenches with mesa regions between adjacent trenches, each of said trenches having sidewalls